JPRS L/9491

19 January 1981

Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 1/81)

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APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000300070026-3

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CONTENTS

JAPAN

INDEPENDENT TECHNOLOGY FOR SATELLITE COMPUTERS

Tokyo TECHNOCRAT in English Sep 80 p 72

[Text]

• MITI has decided on encouraging development of independent technology for "on-board space computers" to be mounted in an artificial satellites. Making much of the space industry, MITI has started in the current fiscal year to develop a unique resources survey satellite called MERES, aiming to launch it in 1985.

The development of on-board computers is intended to be completed in 1987 or 1988 and applications computers for a variety of domestic artificial satellites which will be launched in the latter half of the 1980's, without direct concern with MERES. And it can be regarded as a new nuclear theme in MITI's policy for promoting space the industry, following MERES.

Most of Japan's conventional artificial satellites are designed to effect attitude control by remote operation from an earth station, and to generate and consume power from solar cells while transmitting data to the earth without processing it.

This system, however, has the drawbacks of being incapable of fine control, involving loss of valuable energy and failing to follow the coming satellite age requiring increasingly complicated operations. Again the new satellites are expected to be multifunctional and larger and to deal with increased data. Thus, they are required to be at least capable of primary data processing. And this role can be undertaken by on-board space computers.

MITI intends to utilize the computers for various types of control such as control of the receiving angles of solar cells to direct them consistantly to the sun, giving commands to assign generated power either to batteries or operation, and control of temperature in satellites.

While starting conceptual designing from 1981, MITI intends to start research and development of shielding materials which will protect elements, processors and memories against severe space environmental conditions such as radiation and the non-existance of gravitation. MITI is planning to develop machine No.1 after the model of NSSC1 developed by US IBM.

CSO: 5500

ZAIRE

INAUGURATION OF TELECOMMUNICATIONS NETWORK

Paris AIR & COSMOS in French 29 Nov 80 pp 43-44

[Article by Pierre Langereux]

[Text] Zaire's satellite telecommunications network, known as "REZATELSAT," was inaugurated 23 November 1980 by Citizen-President Mobutu Sese Seko, during the celebration of the 15th anniversary of his accession to power.

Zaire already had a large earth station for international links with the INTELSAT network.

The REZATELSAT network is going to make possible the broadcasting of radio and television programs and the development of telephonic and telegraphic hook-ups throughout the nation's territory.

This major national network, started in 1976--the first equipment went into operation in December 1978--is now completely installed. It includes 13 ground-based transmitting-and-receiving stations, 16 television broadcasting centers, and 11 inter-city telephone stations, as well as much other telecommunications equipment (wireless beams, 6000-line automatic switchboards, telegraphic condensers, mobile TV news units, BLU [expansion unknown] radio hook-ups, etc.). The total cost of the network, installed by French industry, is around 350 million Fr., of which 80 million Fr. is for the ground stations. The operation was financed partly through a mixed loan made of a loan from the French Government and a guaranteed private loan.

The 13 ground stations with antennas 14.5 meters in diameter are installed in the main cities of Zaire: N'Sele (near Kinshasa), Bandundu, M'Bandaka, Gemena, G'Badolite, Isiro, Kisangani, Kindu, Kalemie, Kamina, Bukavu (also serving Goma and Uvira), M'Bujimayi (also serving Kananga), and Lumumbashi (also serving Likasi and Kolwezi).

The link-ups between the stations are provided via international "INTELSAT 4-A" telecommunications satellites--in geostationary orbits over the Atlantic Ocean (1° W.)--for which a relay is leased full-time from INTELSAT by Zaire. This system operating at 4-6 GHz should therefore also be usable with future "INTELSAT 5" satellites, if need be.

The capacity of the relay (36 MHz) will be divided equally between color TV programming (SECAM) [Sequential Memory Color Television System] with audio track (broadcast from the capitals or regional stations), on the one hand, and the transmission of 3 radio programs (including a national program and an FM program), about 100 simultaneous telephone conversations, the telex service of the Zairian Posts and Telecommunications, and a private telex service (in AMRT [expansion unknown]) for the National Press Agency of Kinshasa.

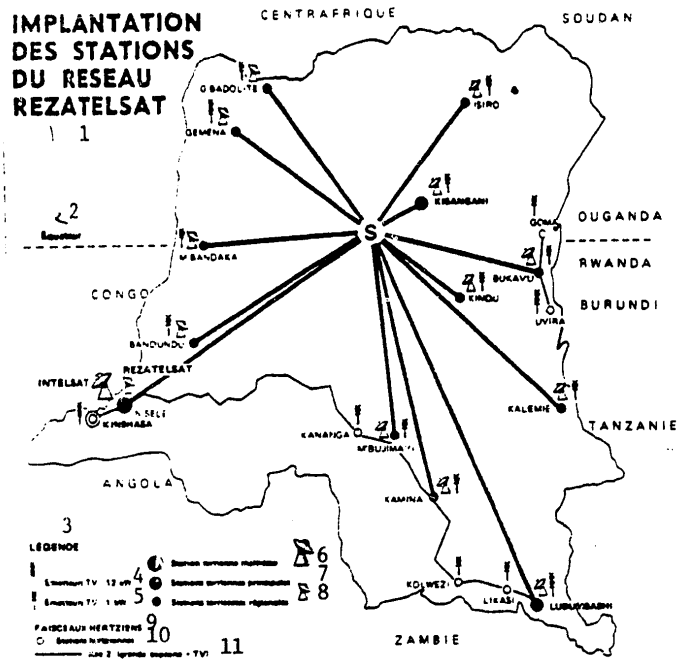
REZATELSAT is one of the largest national networks of space telecommunications in Africa--along with those of Algeria and Nigeria, which were built respectively by the American firms GTE and Harris.

The preliminary study of the REZATELSAT network was done jointly by three official French bodies--ECT, SOFRATEV [expansion unknown], and SOFRACOM [expansion unknown]--with help from the French ministry of posts, telegraph, and telecommunications (PTT) and TDF (the Telediffusion de France company). The Yves Houssin firm was consulting engineer to the Zairian Government and responsible for definition and coordination of the project, the training of personnel and the organization of the system's operation.

The "turn-key" completion of this major project in 36 months was turned over entirely to French industry with Thomson-CSF as general contractor, TELSPACE (Thomson-CSF and CIT-Alcatel 1) as principal subcontractors for the ground stations; the telecommunications equipment having been supplied principally by Thomson-CSF and its subsidiary LGT (Laboratoire General des Telecommunications), as well as by CIT-Alcatel and Neyrtec (Alsthom-Atlantic group). The engineering was provided by Forrest, Guillaume, and Nord-France, and the provision of electrical equipment by Merlin-Gerin and the western motor company.

The erection of this network in a vast equatorial territory covering 2.4 million square km (four times the size of France), topographically quite varied and subject to torrential rains, was particularly difficult. And sometimes even dangerous: the unrest in Kolwezi in particular cost the life of a Telspace engineer.

This network will be used among other things in conjunction with the new City of the "Voice of Zaire" inaugurated in November 1976. This Zairian "radio house", unique in Africa, was built in 30 months by a group of French industrials headed by SODETEG (Thomson-CSF group) and including Thomson-CSF, Schlumberger and Nord-France.



Key:

1. Location of REZATELSAT network stations
2. Equator
3. Legend
4. TV transmitters--12 kW
5. TV transmitters--1 kW
6. Master ground station
7. Principal ground stations
8. Regional ground stations
9. Wireless beams
10. Hertzian stations
11. Axis-2 (large capacity + TV)

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CSO: 5500

FRANCE

'TELECOM-1' SATELLITE LAUNCH PLANS OUTLINED

Paris AIR & COSMOS in French 15 Nov 80 pp 38-42

[Article by Pierre Langereux]

[Text] Space telecommunications have once again become front-page news following two significant developments: the first is the International Congress on New Telecommunication Services and Systems, to be held at Liege (Belgium) from 24 to 26 November; and the second, the Intelcom 80 international show and conference on satellite telecommunications, organized by Horizon House for 10 to 13 November in Los Angeles. Intelcom 80 will notably focus its attention on the French Telecom 1 telematic satellite, whose project leader at MATRA, M. J. Susplugas, presented the most recent developments at the IAF International Astronautic Congress in Tokyo. This project is presented in detail below, as is the launching of the Fleetsatcom 4 satellite, which will complete the United States military network. In our next issue we will publish a report on Intelcom 80.

The first Telecom 1 domestic French telecommunication satellites will be placed in operation in 3 years, at the end of 1983 or early in 1984. Telecom 1 will thus be the first French space network for public and commercial, as well as governmental and military telecommunications.

The construction of the Telecom 1 system was decided on 20 February 1979 at the Elysee Palace by a privy council presided by Valery Giscard d'Estaing, and confirmed on 7 March 1979 by the Council of Ministers, following the recommendations in the report of Yves Cannac, former Elysee counsel and present chairman of the Havas Agency. The report concluded that a national satellite telecommunication system would be profitable, devoted partly to conventional communications (telephone and TV) between France and Dom-Tom (Overseas Departments and Territories), and partly to the new telecommunications services, particularly to "telematics," interest in which had already been indicated in the report of Nora and Minc.

MATRA: General Contractor

Construction of the Telecom 1 satellites was entrusted to the MATRA corporation on 18 September 1979, following a request for bids. MATRA has already been commissioned (within the MESH European industrial consortium) to build the OTS, ECS,

and MARECS European telecommunication satellites, from which Telecom 1 is partially derived. This new contract thus makes MATRA the foremost French telecommunication satellite manufacturer, with 13 satellites to its credit at this point: two OTS, five ECS, three MARECS, and three Telecom 1.

MATRA's final proposal for construction of the Telecom 1 satellites was turned over in May 1980 to the authorities responsible for the program, CNES (National Center for Space Studies) and DGT (General Directorate for Telecommunications).

The contract prepared by MATRA for the final construction phase (C/D phase) is now in the hands of DGT, which in theory is supposed to sign it before the end of this year. But with DGT's approval, C/D phase development efforts were already underway in early June 1980. A system-level project review took place in July 1980, and a subsystem-level review is now being conducted, scheduled for completion in early December 1980.

Three flight models of the Telecom 1 satellite are planned, the first being in fact a prototype brought to flight standards (as in the case of ECS). The service platform for the Telecom 1 satellites will be derived from that of the ECS, whose mechanical model will indeed be used. The payload, whose construction was assigned to Thomson-CSF, is on the other hand entirely new, and there are plans for a complete engineering model whose testing will take place partly in La Turbie.

The bulk of the flight equipment is scheduled for delivery between October 1981 and June 1982, for integration into the new MATRA space center in Toulouse, near the CNES space center. Receipt of flight models is expected in May 1983 for the first satellite, in August 1983 for the second, and in December 1983 for the third.

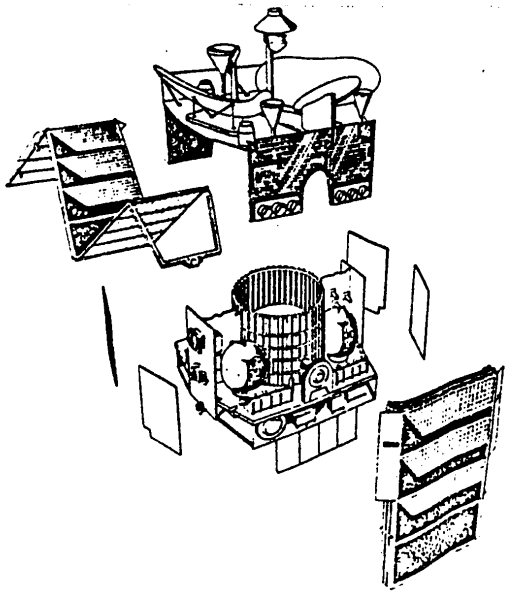
Construction of these first French telecommunication satellites relies heavily on foreign industry -- European and even American -- since about 40 percent of the platform's fabrication and 30 percent of the payload are subcontracted outside France.

European subcontracting is voluntary: the French PTT (Mail, Telegraph, and Telecommunications) is striving to "Europeanize" the Telecom 1 system, even if competing with the European ECS system. In this way the French PTT hopes to turn Telecom 1 into the base of a future European network of telematic satellites -- using the improved Telecom 2-type satellites -- which would provide enterprises located in Europe with services comparable to those of the American "business satellite" networks, such as IBM's SBS and Comsat, and Xerox's X-Ten.

The French PTT thus offers European countries the immediate possibility of utilizing the Telecom 1 network, whose specifications (service standards and transmission protocols) were developed in concert with the other European PTT administrations. Given its areas of coverage, Telecom 1 could be used by several European countries, such as Great Britain, Germany, Benelux, Switzerland, or Italy.

Placement in Operation End of 1983 - Beginning of 1984

The Telecom 1 network will use two operational satellites in geostationary orbit, one of them in service and the other being used as an emergency satellite should the first one fail or should traffic increase. The service satellite will be located



The definition of Telecom 1 satellites is now established. It rests on two major options: maximal reutilization of the ECS technique, and optimization for double launching with Ariane. The Telecom 1 satellites will weigh 1142 kg at launch and 650 kg in geostationary orbit, of which 148 kg will be telecommunications payload, 534 kg service platform, and 497 kg powder-powered apogee engine. These satellites are 3 m high and 2.2 m wide, with a span of 16 m once the solar panels are unfolded. They are equipped with a new ultra-light rigid solar power source developed by Aerospatiale, with power capability of 1045 W at the end of its lifetime; the satellite's total power consumption is 880 W, of which 725 W for the payload and 155 W for services. The Telecom 1 is a definite improvement over the ECS: its weight is 50 percent higher, while the power source is 15 percent greater during normal lighting periods, and of full capacity during darkness. The electronics are modernized (microprocessor) and the supply is rerouted (unregulated bus line). The satellites use the S-band instead of VHF for telemetry, and the telecontrol has been improved in two major ways: the order signals sent to the satellites have been encoded, and the satellites are capable of surviving for one week in the absence of commands. The modular structure with passive thermal control has been enlarged and reinforced. And finally, the three-axis stabilization with two inertia wheels and hydrazine jets provides an automatic reconfiguration system in case of incident.

10 degrees west above the Atlantic, and the emergency one 7 degrees west. A third satellite will be available on the ground, where it will be stored for 5 years -- until the end of 1988.

These one-ton satellites will be launched with European Ariane rockets from the Kourou (French Guyana) launching pad. They will be equipped with an apogee engine for placement into geostationary orbit. The choice of this powder-powered apogee engine is not yet definite: the nominal approach is to use an American (Thiokol) apogee engine, but the satellite builders have been asked to maintain until the spring of 1981, the compatibility with the new European Mage 2 apogee engine, developed cooperatively by SEP (France), MAN (Germany), and SNIA-Viscosa (Italy).

The launching of the first Telecom 1 A satellite is now confirmed for July 1983 (instead of end of 1982), with a simple launch using one of the last Ariane 1 rockets (first version).

The second Telecom 1 B satellite will be launched three months after the first one, in October 1983 (instead of mid-1983), with a double launch using an Ariane 3 rocket (third version) equipped with Aerospatiale's new double-launch system, SYLDA 4400.

We thus note that the launch of the first Telecom 1 has been postponed by more than 6 months with respect to initial predictions; this delay being due partly to the negotiations that preceded the initiation of the program, and partly to the modifications recently introduced by the satellite users (encoding of telecontrol and survival of the satellite in the absence of telecontrol for 1 week).

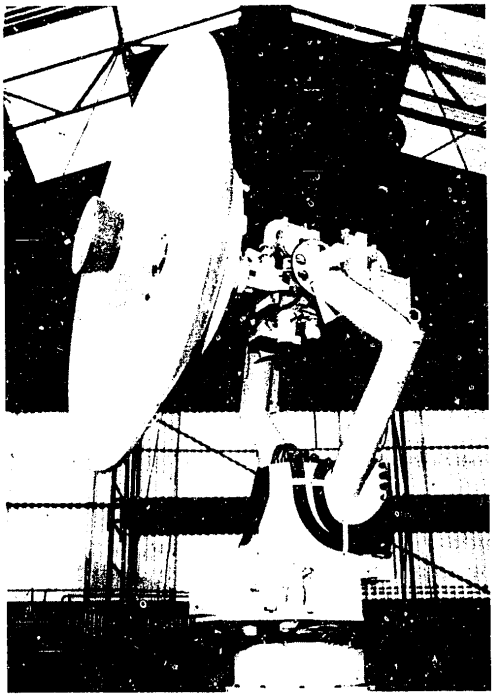
Under these conditions, the placement in operation of the Telecom 1 network has also been postponed to the end of 1983 at the earliest, and possibly to the beginning of 1984.

Triple Mission

The Telecom 1 system will have a three-fold mission. It will be used for simulteneous transmissions of conventional public telephone and television connections (four channels at 4-6 GHz), private connections for enterprises (six channels at 12-14 Ghz), and government and military connections (two channels at 7-8 GHz).

Civilian commercial telecommunication via Telecom 1 are:

A telephone and television service between mainland France and Dom-Tom in the Atlantic Ocean (Guyana, Martinique, Guadeloupe, Saint-Pierre, and Miquelon), and in the Indian Ocean (Reunion and Mayotte), which will use four 20 W TOP amplifier receivers (derived from those of ECS and Intelsat 5) with a unit capacity of 1000 simultaneous telephone communications (in FDMA) or one television program. Two of these repeaters will be assigned to telephone service, and the two others to TV and occasional services, the telephone traffic with Dom-Tom having been estimated at 1800 circuits in 1989 (end of the satellite's lifetime). Access to the satellite will be obtained with antennas of 11.8 m-diameter (standard B Intelsat) in Dom-Tom, and with a 30 m antenna on the mainland. Telecom 1 service will thus replace the connections currently being made through the Intelsat 4 A and Symphonie satellites. It will also make it possible to route the national telephone traffic of other countries, notably in Africa (through the installation of a repeater);



France has already used the French-German Symphonie telecommunication satellites for the Sextius military communication tests, particularly on behalf of the Navy with small on-board stations (photo). This station, built by Thomson-CSF, makes it possible to provide telephone (MRF and MRT) and telegraph communications between land and ships at sea, via the Symphony satellites. It includes a 2.2 m-diameter antenna (protected by an inflatable radome of 3.4 m diameter). The gain is 39.5 dB for sending and receiving in the 4-6 GHz band. The antenna is slaved to the satellite path with a precision of plus or minus 0.25 degrees, at a rate of 0.4 rads/s. This type of on-board station could be used -- in the military frequency band (X-band at 7-8 GHz) -- for connections via Telecom 1.

An intra-enterprise connection service for mainland France and Corsica, allowing wide-band and high-speed numerical transmissions among the various plants of the large companies located in France. Six repeaters with 8.5 W TOP amplifiers are devoted to this service, one of them for video-transmission and five others, with unit capacities of 25 Mbits/s, for numerical data transmission so as to handle the traffic predicted for 1989 (125 Mbits/s).

Telecom 1 will thus enable the development of the new telematic services (video-conferences, rapid telecopy, computer interconnection, and so on), and multiple connections (newspaper teleprinting, numerical transmission of photographs,

and so on) which require extremely wide bands that can reach 2 Mbits/s and more. At first, the French PTT envisions a closed network operation, with a subsequent possibility of accessing other networks of the same type or a general national, or European, telecommunications network.

Access to the satellite will be obtained by assignment on demand, through "multiple access with time sharing" (AMRT/TDMA); ground stations (with fixed 3.5 m-diameter antennas) can readily be installed in enterprises. A network of about 250 stations is planned. The network will be controlled from a central station (with a 5 m-diameter antenna) which will direct the circuits at each station, and will assure the synchronization of the AMRT system. Video transmission will be assured between a mobile sending station (3 m antenna) and a large number of small receiving stations (2 m antennas) installed on the roofs of auditoriums.

Telspace to Build Stations

The total cost of the Telecom 1 program was initially estimated at 1520 million francs (1978 cost), of which about 500 million francs were intended for the station network and about 300 million for satellite launchings.

The cost of the space phase is now estimated at about 750 million francs for construction of the three satellites, contracts being nearly equally divided between MATRA and Thomson-CSF. The space phase is actually composed of three segments: the first consists of fabrication, integration, and satellite testing until launch time, and represents about nine-tenths of the contract; the second involves storage and reactivation expenses for the third satellite; and the third comprises premiums (+12 percent) and penalties (-10 percent) depending on the quality of the satellites' performance in orbit during their projected lifetime (seven years).

The Telspace Group (Thomson-CSF and CIT-Alcatel) was selected in May 1980 by DGT to study and provide all the stations of the Telecom 1 program. The first step is the fabrication of four prototypes of 12-14 GHz stations with 3.5 m antennas (150 W amplifier and 300-degree K low noise receiver), for facilitating intra-enterprise connections. DGT next foresees an industrial program for mass production of intra-enterprise stations, involving 250 units. But DGT has not yet selected the supplier of AMRT equipment for the intra-enterprise stations. Thomson-CSF, CIT-Alcatel, SAT, and MATRA (associated with Comsat) have been consulted.

Thus, the Telecom 1 program will for the first time allow Telspace to build, within a few years, an industrial organization for the mass production of several hundred ground stations. This will make it possible to compete in price with foreign manufacturers -- notably American ones -- on the world market.

Telspace's strategy will thus expand to the construction of small ground stations and to new frequency bands (12-14 GHz), in addition to its traditional large-station activities. Telspace is thus aiming to rapidly reach a volume of orders of 250 million francs per year, despite a slight drop in large-station activity (standard A Intelsat), which constitutes 60 percent of its business at present. The small-station market should compensate for this trend and enable Telspace to double its business volume by 1985. The group was also planning to build two large stations per year, out of ten under construction in the world, and to provide half

of the 15 ground stations of the ECS network. Telspace is also moving toward the procurement of turn-key space telecommunications systems which include ground stations as well as radio beams and TV retransmitters, as Harris (USA) did in Nigeria and NEC (Japan) in Thailand.

Telecom 1 Satellite Builders

MATRA (France): general contractor for satellites, attitude control, propulsion, telemetry-telecontrol, integration, and testing.
BADG (England): on-board power supply, cabling, component procurement.
ERNO (Germany): attitude-control propulsion.
AERITALIA (Italy): structure.
AEROSPATIALE (France): solar power, thermal control, antennas.
ROVSING (Denmark): interface converter and chassis, telemetry-telecontrol.
SAAB (Sweden): decoder and encoder, telemetry-telecontrol.
INTA (Spain): S-band antenna.
FOKKER (Netherlands): nutation damper.
SODERN (France): infrared ground sensor (STA-04).
GALILEO (Italy): solar sensor.
TELDIX (Germany): inertia wheels.
SAGEM (France): attitude-control gyroscopes.
SAFT (France): batteries.
THIOKOL (USA): apogee engine (Star 30).
SEP (France): apogee engine (Mage 2).
THOMSON-CSF (France): responsible for Telcom payload, S-band repeater; telecontrol encoder.
ETCA (Belgium): repeater converter.
GTE ITALIANA (Italy): para-amplifier Ku-14 GHz band.
FORD AEROSPACE (USA): X-band repeaters (military) and Ku-band tube supply.
HUGHES AIRCRAFT (USA): TOP (tube and supply) amplifier 4 GHz.
TELSPACE (France): ground station general contractor.

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EUROSATELLITE GOING AFTER WORLD'S DIRECT TV MARKET

Paris AIR & COSMOS in French 29 Nov 80 p 44

[Article by Pierre Langereux]

[Text] The final by-laws of the new company Eurosatellite GmbH were signed on 21 November 1980 in Munich (Germany) where the French-German-Belgian group will have its headquarters.

Five aerospace companies will henceforth be part of Eurosatellite GmbH: Aerospatiale and Thomson-CSF (France); Messerschmitt-Bolkow-Blohm and AEG-Telefunken (Germany); and ETCA (Belgium). Each of the French and German firms has a 24 percent share of the group and the Belgian firm holds 4 percent. It should be noted that these are shares in the "new" Eurosatellite GmbH company, reorganized on the occasion of the French-German program for direct TV satellites. In fact, Eurosatellite GmbH had been established in May 1978 -- by Aerospatiale (43 percent), MBB (43 percent), and ETCA (14 percent) -- for construction of the European experimental direct television satellite H-SAT, entrusted to the company by ESA after calls for bids, said project being later abandoned by France and Germany in favor of the current pre-operational satellites.

The first Eurosatellite GmbH program is therefore for the French TDF 1 and the German TV-SAT direct TV satellites. But meetings are now being held in hopes of obtaining the industrial participation of several other countries, Aerospatiale has announced. Launchings of these satellites are planned for 1984, with European Ariane rockets in Kourou.

But in fact, the new Eurosatellite GmbH company's activities extend to building and marketing direct TV satellites on the world market. In this way the company hopes to answer the calls for bids which are expected from many countries, notably Luxumbourg, Switzerland, Saudi Arabia, China, and the Scandinavian countries. It must be remembered that Eurosatellite has already delivered a Luxsat project to RTL and that MBB started negotiations several years ago with China for its direct TV satellite project. Eurosatellite will offer satellites appropriate for TV broadcasting, using either heavy platforms (Ariane class) or intermediate weight platforms.

Eurosatellite member-firms are all already associated with the Symphonie project which is the first three-axis stabilized telecommunications satellite built in Europe, as well as with the international telecommunications satellite program Intelsat 5, of the Intelsat organization, the first model of which will be launched on 4 December 1980.

Eurosatellite members thus have built over 30 satellites since 1965. From now on, Eurosatellite therefore ranks as the first non-American group in the applied satellite field, and particularly in telecommunications satellites.

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CSO: 5500

ORGANIZATION OF FRANCO-GERMAN DIRECT TV APPARATUS

Paris AIR & COSMOS in French 29 Nov 80 p 44

[Article by Pierre Langereux]

[Text] The organization of the Franco-German direct TV program is fairly complex. A Program Direction Committee gathers representatives of state organisms responsible for the ADF 1 French satellite and the TV-SAT German satellite. This Program Direction Committee, which supervises overall operations, is composed of four members: Mr Sillard (CNES) and Mr Remy (TDF) for France; Mr Strub (BmFT) and Mr Steiner (BundesPost) for Germany.

An Executive Secretariat is responsible for executing the Franco-German program. The executive secretary is a Frenchman, Mr Franchini (CNES), with a German assistant, Mr Fabis (DFVLR).

Eurosatellite GmbH is the company designated to build the French and German satellites. This company, whose new by-laws were just signed on 21 November 1980 in Munich, is presided by Yves Barbe, assistant director general of Aerospatiale. Executives of Eurosatellite will be named later.

A Coordination Group is in charge of scheduling projects among companies and technical specifications for each of the French and German satellites, in order to obtain a maximum joint effort. This organizational plan consists of two parts: a Satellite Coordination Group composed of Mr Schubert (MBB) and Mr Chauvallon (Aerospatiale); and a Payload Coordination Group which consists of Mr Loeffler (Thomson-CSF) and Mr Hartbaum (AEG-Telefunken).

Project leaders responsible for the construction of the Franco-German satellites are Mr Goeschel (MBB) and Mr Gault (Aerospatiale-Cannes). Integration of the satellites will be shared by the two firms: TDF 1 will be integrated by Aerospatiale in Cannes (France) and TV-SAT by MBB in Ottobrunn (Germany.)

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END